

WinFrog Device Group:	USBL
Device Name/Model:	GENERIC RHO/THETA
Device Manufacturer:	Generic Device, or Manual Input
Device Data String(s) Output to WinFrog (Manual Input):	(Target) ID, Bearing, Range, Height (this is converted to USBL XYZ type data)
Device Data String(s) Output to WinFrog (Serial Input):	(Target) ID, Bearing, Range Any common separator can separate Fields. (this is converted to USBL XYZ type data)
WinFrog Data String(s) Output to Device:	Nil
WinFrog .raw Data Record Type(s):	Type 309

DEVICE DESCRIPTION:

This WinFrog device driver can be used for more than 1 individual device.

In Manual Input Mode, this device allows you to manually enter a Target ID, bearing, range and height. This information is then used to calculate USBL type data (X, Y, Z). This data is then available for use with a vehicle in the same manner as a standard USBL system.

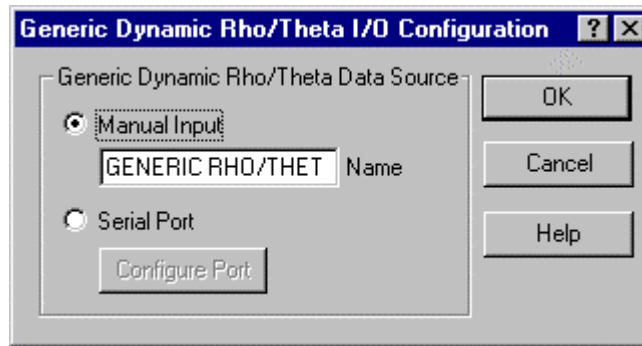
In Serial Input Mode, this same driver is configurable as a Generic Rho/Theta device. This input is limited to an ASCII string consisting of an (integer) target ID, range, and the forward bearing in degrees. A common separator must separate each field.

DEVICE CONFIGURATION INSTRUCTIONS:

Baud Rate: Configurable
 Stop Bits: Configurable
 Parity: Configurable
 Data Bits: Configurable

WINFROG I/O DEVICES > CONFIG OPTIONS:

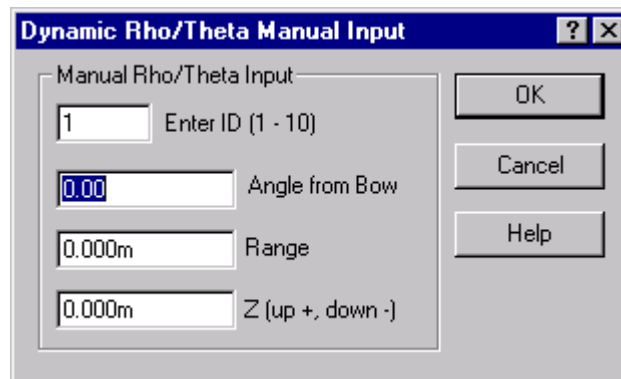
The Generic Rho/Theta device is added to WinFrog via the USBL device category. When the device is added to Winfrog, the **Generic Dynamic Rho/Theta I/O Configuration** dialog box appears, as seen below.



In this dialog box you can define whether the device is to have **Manual Input** or **Serial Port** input, by selecting the appropriate radio button. If the **Manual Input** radio button is selected, you can use the provided entry window to change the name of the “device”. If the **Serial Port** radio button is selected, click the **Configure Port** button to define the device name and I/O parameters.

Manual Rho/Theta:

If **Manual Input** mode is selected, the **Dynamic Rho/Theta Manual Input** dialog box appears as seen below (once the OK button is clicked).



This dialog box allows you to enter Rho/Theta/Z (i.e. distance/bearing/depth) information to calculate a USBL type X/Y/Z position. Inputs are as follows:

Enter ID

Enter an integer Target/Station ID between 1 and 10. If there are multiple Manual Rho/theta devices, each must have a unique ID.

Angle from Bow

Enter the angle in degrees and decimal degrees. This entry is as measured from the vessel’s centerline, clockwise from North. The input is tested for $0 \geq \text{angle} \leq 360$.

Range

Enter the **horizontal** range to the target. Note that the units of entry can be changed by selecting the main menu item **Configure >Units>Distances**. The input is tested for positive values $\leq 25,000\text{m}$.

Z

Enter the vertical separation value. Note that if the target/station is higher than the reference point, the value is positive. The input is tested for: $-3,000\text{m} \geq Z \leq +3,000\text{m}$. As mentioned above, the units of entry can be changed by selecting the main menu item **Configure >Units>Distances**.

The entered values are applied to the USBL/GENERIC RHO/THETA BEACON position when you exit this dialog box by clicking the OK button.

To change these values in real time, highlight the GENERIC RHO/THETA device in the **I/O Devices** window, then right-click and select Configure Device.

When Manual Input mode is used, WinFrog provides a device update once every second. When Serial Input mode is used, WinFrog provides a device update every time a data string is successfully received from the interfaced device.

WINFROG VEHICLE TEXT WINDOW> CONFIGURE VEHICLE DEVICES > DEVICE > EDIT OPTIONS:

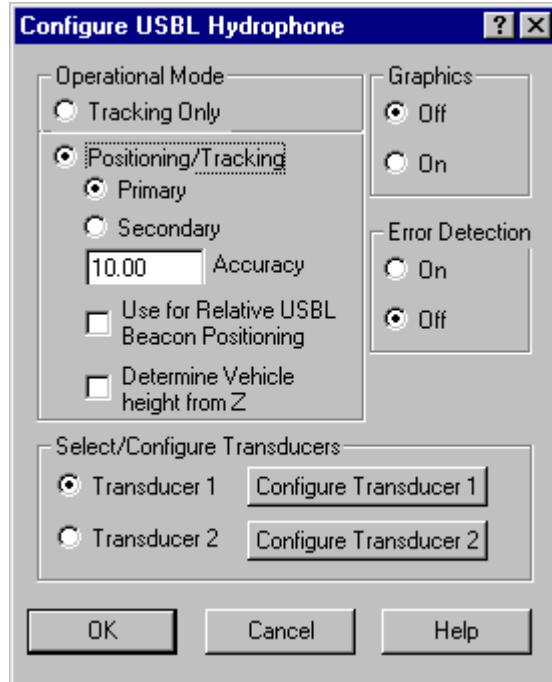
Adding the GENERIC RHO/THETA device to WinFrog creates two separate data items: the USBL, GENERIC RHO/THETA, USBL HYDROPHONE and the USBL, GENERIC RHO/THETA, BEACON.

For remote vehicle tracking, the USBL GENERIC RHO/THETA Hydrophone data item must be added to the device list of the vehicle to which the hydrophone has been physically attached (i.e. the main ship). The Beacon data item must be added to the vehicle to which the beacon has been physically attached (i.e. the ROV or towed vehicle).

USBL systems can also be used for positioning of the main vessel. In this type of operation the USBL Beacon must be physically attached to some fixed point on the seabed or subsurface structure. In this type of operation the Hydrophone position (i.e. vehicle position) is derived from measurements made to the fixed beacon. For this type of positioning, you must define a working Xponder File (*.XPT) in WinFrog, and enter the fixed position of the Beacon into that file. The Hydrophone must be added to the ship's device list and configured for positioning as opposed to tracking mode. Refer to chapter 18 of the WinFrog Users Guide for details on positioning and tracking modes

1. Configuration of the USBL Hydrophone.

Once the GENERIC RHO/THETA Hydrophone has been added to the appropriate vehicle's device list it must be edited to suit the application. In the vehicle's Devices list, highlight the USBL, GENERIC RHO/THETA, USBL HYDROPHONE then click the Edit button. The Configure USBL Hydrophone dialog box appears as seen below.



Operational Mode:

As mentioned above, USBL systems can be used for tracking of remote vehicles or for positioning of the Master Vessel to which the hydrophone is attached. The Master Vessel would have to be positioned by GPS or some other positioning device/input. Select **Tracking Only** if relative tracking of a structure/vessel is desired.

Select **Positioning/Tracking** and **Primary** if you want to position the Master Vessel relative to a stationary (fixed) beacon. The beacon must be located on the stationary (fixed) object, as defined in a working XPONDER (.XPT) file. Select the **Secondary** radio button if this is not the primary positioning source (i.e. if this is a comparison position), or if you are setting up for a USBL Calibration. Refer to chapter 20 of the WinFrog User's Guide for more details on USBL Calibrations.

Graphics:

Setting the Graphics to **On** will display the device name and a square at the location of the Hydrophone, within the Graphics windows.

Error Detection:

By enabling this option, error detection codes are included in the Raw Files. This option is mainly for post project QC analysis and future development.

Select/Configure Transducers Window:

Some USBL systems can be configured with two hydrophones. Before configuring a transducer ensure that it is the correct one, and that the values entered refer to that device. Click Configure Transducer 1 or Configure Transducer 2 as required. The Configure USBL Transducer dialog box appears as seen below.

Calibration Corrections		
Range Scale Factor		Head Rotation Correction
<input type="text" value="1.00000"/>		<input type="text" value="000.0"/>
Pitch Correction		Roll Correction
<input type="text" value="0.00"/>		<input type="text" value="0.00"/>

NOTE: Corrections sign conventions are
Roll=(+)Stbd down; Pitch=(+)Stern down

Offsets from the point the data is related to, to the transducer. These values will be subtracted from the USBL output data to get data related to the transducer.		
Fore/Aft	Port/Stbd	Z (down +)
<input type="text" value="0.0m"/>	<input type="text" value="0.0m"/>	<input type="text" value="0.0m"/>

WinFrog Offsets, from CRP to Transducer		
Fore/Aft	Port/Stbd	Depth (down +)
<input type="text" value="-100"/>	<input type="text" value="8"/>	<input type="text" value="12"/>

OK Cancel Help

Calibration Corrections:

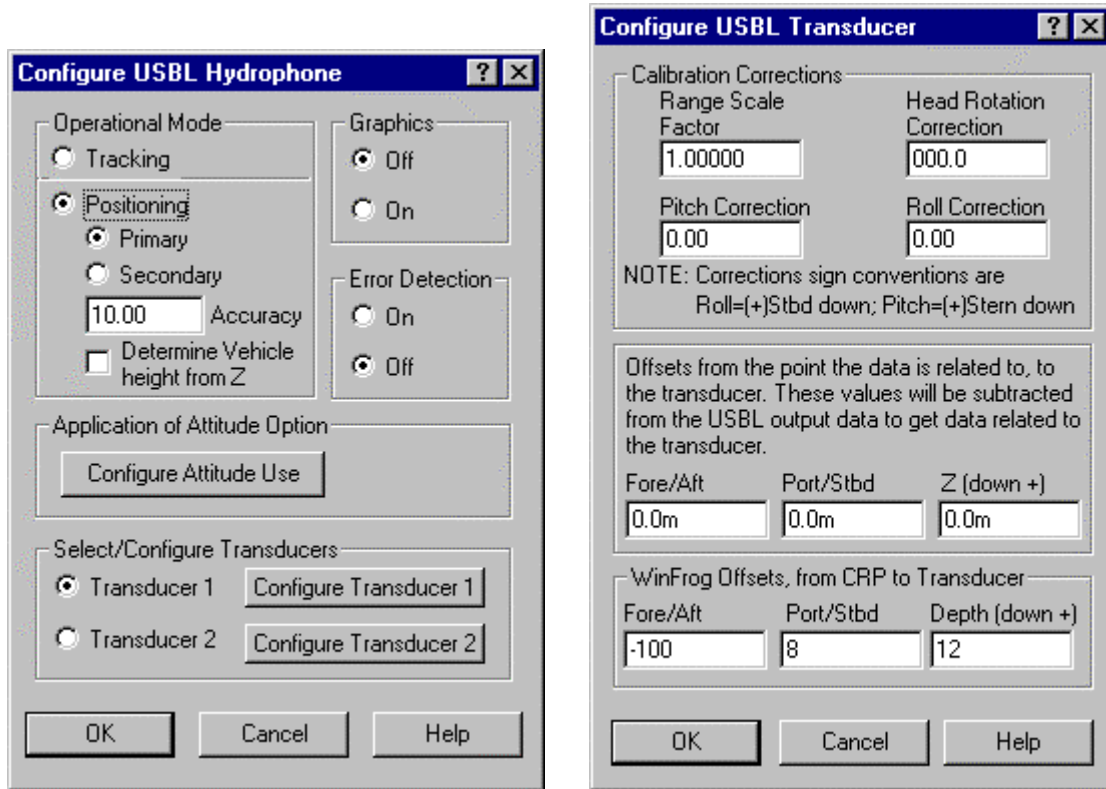
With Generic Rho/Theta input, calibration constants can be input, however, would not usually be required.

USBL System Internal Offsets:

The upper fields are used to remove any offsets that have been entered into a Serial Input Device, i.e. by inputting the same offset to Winfrog, as is in the Device Command Unit (if applicable), you can null and void the offset in the Device. As these values are subtracted from the received data, ensure that values are entered using the same sign as entered into the Device Command Unit. This may come into use specifically when USBL systems are used for vessel positioning, where the ship's DP system needs positional information to relate to the vessel's center of gravity as opposed to just at the USBL hydrophone. WinFrog however requires all XYZ offsets to relate to the USBL hydrophone. This option should not be required for Manual Data Inputs.

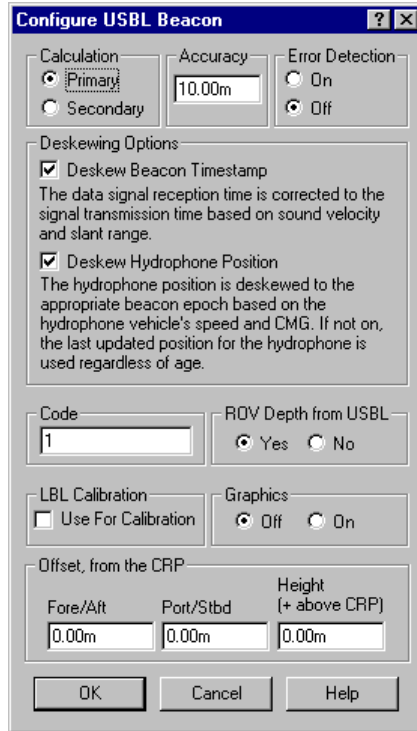
The lower fields, **Winfrog Offsets, from CRP to Transducer**, are similar to all other positional device offsets entered in Winfrog. These offsets must be entered to relate

the hydrophone's position to the vessel's Common reference point (CRP). All offsets are entered with signage referring to the distance *from* the CRP *to* the hydrophone. For the example below, the total station is located 100 (m) aft, 8 (m) starboard and 12 (m) below the CRP.



2. Configuration of the USBL Beacon.

As mentioned above, for subsurface vehicle positioning, the USBL beacon must be added to the appropriate vehicle's device list. Once added to the device list, it must be edited to suit the application. Editing the USBL, Generic Rho/Theta, Beacon device brings up the Configure USBL Beacon dialog box, as seen below.



Calculation

Set Calculation to **Primary** if the beacon is to be used for positioning the vehicle to which it is attached. Multiple beacons can be added to the same vehicle's device list, each configured as Primary. WinFrog will calculate a weighted mean position using the Accuracy value entered.

Accuracy

This value is used by WinFrog to weight the use of different positioning devices in solving a single vehicle's position. The lower the accuracy value entered, the more accurate it is deemed to be, and hence the more weight that will be applied to it in comparison to the other devices.

Error Detection:

Setting Error Detection to 'On' instructs WinFrog to identify error codes received in the USBL data string and disable the use of bad data. USBL systems include various error codes in the data string when the beacon is not within the optimum "cone of operation" or other operational parameters have been exceeded

Deskewing Options

Deskew Beacon Timestamp

This option is for future development.

Deskew Hydrophone Position

When positioning the beacon, WinFrog uses the last calculated position for the associated USBL Hydrophone to determine the tracked beacon's position.

Depending on the vehicle's Kalman filter and Dead Reckoning settings, the position of the hydrophone may be up to 1 second old. It is recommended that this deskewing option be enabled to remove positional inaccuracies associated with this latency.

Code:

Code will default to one (1). Enter a value matching the code of the beacon attached to the vehicle.

ROV Depth from USBL:

If **Yes** is selected, the ROV's depth will be set to the calculated USBL beacon depth.

LBL Calibration:

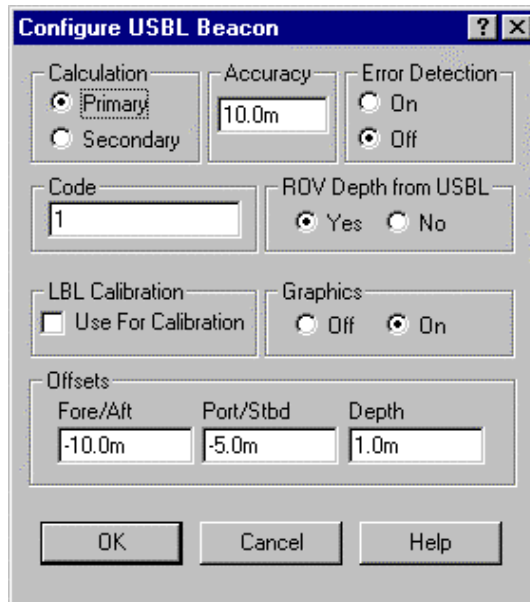
Select the **Use for Calibration** checkbox if the beacon is to be used in an LBL Calibration.

Graphics:

Select Graphics to **On** to have WinFrog plot a square and label to represent the beacon location in the Graphics and Bird's Eye displays.

Offsets:

The Offsets are applied from CRP (of the ROV, towed vehicle or structure) to the Beacon Location. These values are set similar to values that would be applied to any device offset within Winfrog. For the example below, the Beacon is located 10 (m) aft, 5 (m) port, and 1 (m) below the CRP.



CONFIGURATION DETAILS:

Refer to the Operation Manual for each specific device interfaced. For serial input devices interface specifications and available output formats may also be required.